BioCollaboration Focus Group

Sampling of Current Federal Solicitations

BAA 07-21
Office: DARPA-Defense Science Office (DSO)

Type: Presolicitation Notice

Due Date: This BAA will be through **29 February 2008**

The mission of the Defense Advanced Research Projects Agency's (DARPA) Defense Sciences Office (DSO) is to identify and pursue high-risk/high- payoff research initiatives throughout a broad spectrum of the science and engineering disciplines, and to transform these initiatives into important, radically new military capabilities. To carry out this mission, DSO seeks research ideas and areas that might lead to innovations in science and engineering. Therefore, DSO is soliciting proposals for advanced research and development in a variety of enabling technical areas as described below.

Specific areas of interest include, but are not limited to:

New Materials, Materials Concepts, Materials Processing and Devices:
- Demonstrations of multifunctional (structure + function) materials;
- Demonstrations of smart materials and structures;
- Novel approaches for manufacturing and self-assembly of materials and structures;
- Engineered materials and material systems with designed structure and morphology (e.g., meta-materials);
- Novel functional (e.g., magnetic, optical) materials;
- Materials and enabling technologies for power generation and energy storage at all scales;
- Materials structures and devices for use in space environment;
- Materials and structures with functionalized engineered surfaces;
- Materials for ultra lightweight armor and protection from blast and non-lethal weapons;
- Novel approaches to non-destructive evaluation, property/life prediction and related technologies;
- Materials and enabling technologies for measuring and controlling quantum and non-equilibrium behavior (e.g., atom interferometers; slowing, storing, and processing of light; quantum computation and communication, etc.);
- Materials and rapid screening technologies for molecular-based memory and computing;
- Lightweight or thin film materials with near zero coefficient of thermal expansion;
- Biomaterials and biomimetic materials, including adaptive/malleable systems;
- Self-healing, -sensing and -adapting materials;

- Engineered material systems control of mechanical, electrical, electromagnetic, and thermal properties;
- Ubiquitous biologically based material for electronic device and electronic fabrication;
- Materials and material systems for autonomous regeneration of surface properties; and
- Materials and processing methods that enable multi-parameter, high spatial and temporal resolution single-molecule spectroscopy.

Living Materials, Programmable and Self-Assembly:
- New concepts in materials that translate biomolecular mechanisms to innovative, highly advantages new routes for material and device systems;
- New mechanisms for dynamic self-assembly of hierarchical and device synthesis;
- Novel biotic-abiotic material systems that exhibit multifunctional behavior;
- Novel biotic-abiotic material systems that are robust, durable, and survivable in operating environments relevant to military platforms;
- New methods for direct manipulation and control of biomaterials (e.g. proteins) on length scales and temporal scales commensurate with biological processes;
- New concepts for dynamically reconfigurable composite materials;
- Materials whose properties are pre-programmable or evolvable in response to stimuli;
- Real-time methods to determine the structure of biomolecules and cell surfaces in solution;
- New methods to achieve precise molecular recognition;
- New tools to enable large-scale systems biology including real-time parallel measurement of molecular size;
- New self-assembled materials;
- Artificial recognition elements (e.g., antibody mimetics); and
- Technologies for fabrication of particles and functional structures in the microns-to-millimeters size range, with arbitrary geometry.

Defense against Weapons of Mass Destruction: Technologies to render biological, chemical, nuclear, or radiation attacks against the U.S. military harmless:
- Unique approaches for pre-symptomatic diagnosis of disease and health;
- Remote detection/characterization of naturally occurring or engineered biological substances;
- Technologies that radically accelerate pre-clinical evaluation of the safety or efficacy of therapeutics and vaccines;
- Accelerated, high-yield manufacture of biological therapeutics, including vaccines and immune modifiers.

Applications of Biology to Defense Applications:
- Biological approaches for maintaining the warfighter's performance, capabilities and medical survival in the face of harsh battlefield conditions;
- Biological approaches for minimizing the after-effects of battle injuries, including neurotrauma from penetrating and non-penetrating injuries as well as faster recuperation from battlefield injuries and wounds;

- Approaches for maintaining the general health of deployed troops;
- Bio-inspired systems;
- Biomolecular devices;
- Biological approaches to the growth of materials and devices;
- Understanding the human effects of non-lethal weapons;
- Micro/nano-scale technologies for non-invasive assessment of health (e.g., vital signs, blood chemistry);
- Technologies to enable remote interrogation and control of biological systems at the system/organ/tissue/cellular/molecular scales;
- Investigation of the interactions between physical forces, materials and biology (e.g., interface of biology with magnetics);
- Novel mathematical and computational approaches to characterizing and simulating complex biological processes;
- New technologies to drastically reduce the logistics burden of medical treatment in the field;
- Advanced signal processing techniques for the decoding of neural signals in real time, specifically those associated with operationally relevant cognitive events, including target detection, errors, and other decision-making processes;
- Novel techniques and experimental methods for understanding the impact of stress on the brain: including information processing, decision making, attention and memory with a specific interest in translating work on animal models to human populations;
- Systems biology approaches to emitter/receiver hard problems including human to human communications, chemical signaling (e.g. olfaction) and other information transductions common in biology;
- Novel interface and sensor designs for interacting with the central (cortical and subcortical structures) and peripheral nervous systems, with a particular emphasis on non-invasive and/or non-contact approaches;
- New approaches for understanding and predicting the behavior of individuals and groups, especially those that elucidate the neurobiological basis of behavior and decision making; and

- Technologies to engineer field medical therapies at the point of care, such as production of multiple drugs from a single pro-drug, or to adapt therapies for wide variations in body mass, metabolism, or physiologic stress.

BAA 07-44 Sensor Tape

Office: DARPA-Science Technology Office (STO)

Type: Presolicitation Notice

Due Date: This BAA will be through **19 June 2008.**

NOTE: Although this BAA will be through 19 June 2008, the Government anticipates that the majority of initial funding for this program will be committed during First Selections. To be considered for funding during First Selections, full proposals must be received no later than 4:00 PM local Arlington, Virginia time on August 13, 2007.

DARPA STO is soliciting research proposals to develop, test and demonstrate medical monitoring systems for DoD applications and operations. The objective of this program is to develop low-cost medical sensor systems to support DoD missions, in particular to measure the cumulative effects of blast exposure, and to assist in combat medical care, patient triage, and physiologic monitoring in support of physiologic performance. It is anticipated that meeting the goals of this program will require furthering print-on electronics and ink formulation technologies. DARPA is interested in receiving proposals that exploit the novel properties of print-on electronics to develop these medical monitoring systems.

There are two principle systems of interest:

- Helmet (or body-mounted) blast dosimeters; and
- Basic patient physiological monitoring devices that measure, for example, heart rate, body temperature, pulse, respiration and blood oxygen saturation.

Each system should consist of a patch-like sensor device, and a monitoring unit for communicating with the sensor tape patch. Other innovative medical devices that incorporate print-on electronics and related enabling technologies may also be proposed. Proposals may address one or more systems of interest, but must propose a full and complete program for the development, test, field demonstration and, if necessary for the proposed device, Food and Drug Administration (FDA) approval of each system.

SN 06-16 Armor Challenge

Agency: DARPA-Defense Science Office (DSO)

Type: Special Notice

Due Date: Submissions accepted through **Jan. 26, 2008**

The focus of the Armor Challenge is to identify promising armor systems for military vehicles. There is no requirement to include specific classes of materials in the armor, although it is anticipated that successful systems may be combinations of more than one material type. Passive armor systems are desired. However, non-passive systems operating within the confines of the armor will be considered. "Bullet-on-bullet" or similar techniques that use a projectile or directed energy to defeat a threat beyond the plane of the armor panel are outside the scope of this challenge.

The primary goal for the Armor Challenge is a 50% reduction in weight compared to rolled homogeneous armor (RHA) steel for the following two threats: (1) 7.62mm armor piercing round (specific type to be determined), and (2) 0.50 caliber fragment simulating projectile (FSP). A secondary goal is the feasibility for producing vehicle armor materials at a cost competitive with or less than RHA steel.

Proposers should expect to deliver three (3) eighteen inch (18 in.) by eighteen inch (18 in.) panels for each threat to be addressed. It is acceptable to propose a different panel configuration or weight to address each threat, but armor systems that can provide protection against the range of threats using a single configuration will be evaluated more favorably.

BAA0801TYN-LGCB

Agency: Air Force Research Laboratory, AFRL/RXQ, Airbase Technologies Division

Type: Special Notice

Due Date: The solicitation period is approximately one year (Date issued-**30 Sep 2008)**.

AFRL/RXQ is soliciting white papers (technical and cost proposals if accepted) in the following research areas (in whole or part):

Protection of Forces and Assets - Develop threat detection methods and technology for explosives, and radioactive/nuclear materials used in Improvised Explosive Devices (IED) including those deployed in vehicles, packages, cargo, and personnel. Develop new and adapt existing tactics, techniques, and procedures (TTP) utilizing threat detection methods and technology. Develop evaluation and characterization methods and models for materials, facilities, construction methods, and AF assets for explosives and explosive effects. Develop, evaluate, modify, and integrate new and commercial protective materials and technologies that mitigate blast, ballistic, and fragmentation effects from conventional and improvised explosive devices and munitions. Develop lightweight rapidly deployable personnel and aircraft shelters and protection systems for facilities and aircraft parking areas. Specific areas of interest include ultra-lightweight, high-strength materials, exploitation of in situ materials, and facility post-construction reinforcement, air-blast and fragmentation effects simulation and modeling, and chemical/biological protection systems. Develop chemical processes and passive or self-decontaminating materials that reduce recovery time and/or provide a significant improvement in removing, neutralizing or rejecting chemical, biological or industrial contaminants and/or in decontamination capabilities. Develop sensing, active and passive protection, and decontamination technologies for improved force protection at fixed and forward airbases. Develop systems for detecting and quantifying toxic materials or hazards (chemical, biological, radiological, and energetic). Provide technology for automated hazard warning/avoidance, neutralization or decontamination, and decontamination validation in operational areas and industrial sites. Develop technologies that are simple for airmen to maintain and operate, affordable, deployable, modular, and allow for rapid mobilization/demobilization, assurance of effective equipment and operational area decontamination and ability to continue shirtsleeve-environment operations.

Airbase and Perimeter Defense - Develop methods, procedures, and tools for conducting airbase threat assessments and defining effective mitigation strategies. Develop, adapt, and integrate new/emerging technologies for use in force multiplication of airbase security operations. Develop and/or evaluate innovative advances in personnel, perimeter and area monitoring/surveillance technologies. Develop and/or

evaluate novel intelligence/information/data fusion technologies to allow attack anticipation against airbase personnel/facilities. Develop and/or evaluate the integration of these technologies into AF/DoD operations.

Security Technologies - Identify and develop domestic and deployed base enhanced physical security capabilities. Develop and/or evaluate technologies to detect, analyze, and respond to radiological, nuclear, and explosive threats. Develop and/or evaluate technologies leading to innovative, low energy trace sample collection techniques/technologies for aerosol, vapor or residues in DOD shipped cargo. Develop and/or evaluate innovative advances in personnel, perimeter and area monitoring/surveillance technologies.

Airbase Operating Surfaces - Develop lightweight portable airfield evaluation technologies for surface and subsurface material characterization; expedient repair materials, equipment, and techniques for concrete and asphalt pavements; geopolymer concrete-like materials; heat resistant pavement materials, coatings, and processes; measurement and prediction in response to aircraft traffic and environmental loads; equipment or processes for conducting thermal shock testing on pavement materials; and autonomous systems for remotely assessing airfield pavement condition.

Energy & Reactor Systems - Develop innovative deployed energy and chemical reactor systems technologies to maximize mobility, reliability, and operating efficiency. Energy systems specific areas of interest include: fuel reforming to produce hydrogen for fuel cell use, liquid fuel desulfurization, sulfur tolerant anode fuel cell, active and passive power generation, flexible solar cells, renewable energy, waste into liquid fuel conversion, bio-energy and bio fuels suitable for deployed ground power, lightweight energy storage systems, power conditioning and distribution systems, and environmental control units. Reactor systems specific areas of interest are: (1) produce and deliver, weapon system specific chemicals in combat quantities, under deployed force conditions, (2) efficiently produce thermal, mechanical or electrical energy on demand using innovative chemistry and reactor systems, and (3) convert or dissipate energy produced from military operations. In addition, desired reactor systems and unit operations (1) utilize compact and light weight designs (2) are compatible with force deployment constraints, and/or (3) utilize new materials or innovative approaches using conventional materials. Systems developed should integrate with existing deployed base energy and utility systems to meet AEF operational doctrine requirements.

Robotic Systems - Develop automation and intelligent system technologies for use in high threat areas, expeditionary and fixed airbase support, and homeland security. The general areas of interest include novel unmanned force protection technologies including civil engineering, explosive ordnance disposal, security forces, and airbase support operations. Specific areas include: Automated fueling technologies; Unexploded

Ordinance (UXO) detection, characterization, handling, and disposal; advanced ground vehicle navigation and guidance; obstacle detection systems; non-line of sight, high bandwidth, wireless communication systems; and innovative robotic vehicle systems including: perception, power, weapons, computing, manipulation, and mobility systems.

Fire Fighting - Develop agents, systems, equipment and hardware for use in aircraft firefighting and rescue operations, airbase structural firefighting, weapons systems firefighting, hazardous materials incidents, and improved firefighter training. Develop DoD firefighting systems such as munitions protection and explosion mitigation. Specific areas of interest include development of environmentally compatible, operational and cost effective fire extinguishing agents, aircraft rescue and firefighting vehicles/systems, fire detection/suppression systems, specialized rescue and personnel protective equipment, and training technologies. The objective is to enhance airbase and other DoD firefighting safety programs and training capabilities that significantly reduce fire extinguishing times, extract victims, and minimize damage/casualties.

Biofunctionalized Materials - Design, construct and understand materials that integrate biological molecules with inorganic support materials. Fundamental research should address molecular characterization of the bio/nano interface and understanding behavior of biomolecules fixed in solid state materials. Engineering research should address integration of biofunctionalized nanomaterials and composites with devices and practical supports, e.g. transducers, electrodes, fabrics. Specific areas of interest include: sensor component development to detect chemical and biological threats, materials used for decontamination/threat neutralization processes, chemical and microbiological barrier materials, and fuel cell biomaterials.